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ABSTRACT

The origins of educational research are examined in order to understand its original purposes, assumptions, and effects, both intended and unintended. Changes in research are also noted, as public education has been assigned additional responsibilities to meet the requirements of a new social and economic order. This paper discusses the controversy over the date of the origin of modern educational research--whether it began with Joseph Mayer Rice in 1897 or in 1918 with the beginning of standardized objective tests. At about the same time, it is noted, high school attendance grew dramatically and universities showed growing interest in teacher education. The status of education as a science, and the relationship of psychology to educational processes are discussed. Travers' argument that educational research began 140 years ago--building on the foundations of public schooling set by Henry Barnard, Horace Mann, and William Torrey Harris--is also presented. Other topics include the child study movement, experimental pedagogy, and the hypothetical scientific method illustrated by Darwin. (GDC)

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A Critique of the Literature

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The Origins of Educational Research: A Critique of the Literature

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During a period when there is uncertainty about what educational research is, its effectiveness, and the direction it should take;[1] when researchers are questioning the utility of traditional perspectives[2] and trying to figure out how we can use what we know;[3] when the social assumptions and significance of traditional research paradigms (empirical-analytical) as well as newer ones (symbolic interaction and ethnomethodological) are being analyzed and debated;[4] when there is legitimate concern about the level at which the research enterprise will be supported; and most important, when there are many competing and conflicting calls for school improvement and reform, it seems appropriate to examine the origins of educational research to understand its original purposes, assumptions and effects--intended and unintended--as well as how those have been transfomred as public education has been assigned additional responsibilities to meet the requrements of a new social-economic order. It may be true that "the current debate about paradigms can be viewed as emerging from a variety of historical, social and intellectual sources,"[5] but it is also likely that competition among intellectual traditions to set the standards for our inquiries extends beyond the 1960s when the issues were so clearly and forcefully defined.

To understand the assumptions, purposes, and problems of the founders of educational research is to understand something about the direction

assigned to us, for educational research, like more precisely defined areas of inquiry, is an activity that builds upon itself. As D. C. Phillips has observed, "research usually is inspired by a theoretical position, and is part of an ongoing process or loosely defined movement."[6] Even when we find it necessary to refute what has been bequeathed to us, our predecessors are participating in the definition of our inquiries just as we frame the questions for our critics and successors. To understand what considerations, assumptions, and purposes shaped the beginnings of educational research is to gain some insight into why educational researchers select and define problems as they do, why they seek to be located in some parts of some institutions and not others, the alliances they seek to establish and maintain, the associations they maintain, and the ways in which they train their successors. To understand the choices available to them and why they chose as they did may help us to comprehend and to appreciate the choices before us. Possibly, our history may help us to understand why so much attention has been paid to learning and its assessment and why so little to teaching.[7] If nothing else, an understanding of our origins and the assumptions passed on to us should free us from the notion that our history is but a progress report or an explanation of why so little progress has been made. While we may continue to work on problems set before us by our predecessors, we also have problems they did not confront. Some have been generated by our own inquiries and purposes and others by the society and schools we serve. Knowledge of the discontinuities and novelities as well as the continuities in our history may be instructive.

Discussions of what constitutes educational research;[8] whether it is a field, discipline, science, or something else;[9] whether it differs from

the natural sciences because it "is not a natural phenomenon . . . not one of the givens in our universe;"[10] whether it is an art, like engineering, which "progressively incorporates more and more of science into itself;[11] whether it has its own knowledge base and methods or whether "the conceptual and methodological problems of educational research are very similar to the problems of psychological and sociological research;"[12] whether research that is neither historical nor social scientific is "not as important as" that which is;[13] whether educational researchers should abandon the quest for nature's regularities and focus on matters of educational policy;[14] how much attention should be devoted to "conclusion-oriented" inquiry and how much to "decision-oriented" inquiry;[15] whether educational researchers served the managers of educational bureaucracies while neglecting the interests and needs of students and teachers; whether educational researchers "did not inquire in any fundamental or open-minded way into the conflicting goals of education, but tended to take purposes for granted;"[16] whether educational research has been "the instrument of the conservative leader, and not the tool through which education would be radically transfomred;"[17] and whether it has, in fact, made any difference[18] are, in large measure, reflections of a magnificiently rich, complex, confusing, confusing and frustrating history.

While it can be argued that the Cooperative Research Act of 1954--an act passed before what educators believed to be an unprecedented period of unusually severe criticism of public education[19] had subsided--was recognition that educational research in academic settings was essential for the national welfare, we remain either ignorant or confused about the beginnings of educational research. From the scarce literature we now have, one could write a simple multiple choice question about the origins

of educational research. For the question, "When did modern educational research begin," the possible answers are: (a) It began about seventy years ago; (b) It began nearly a hundred years ago; (c) It began just over a hundred years ago; (d) It began about a hundred and forty years ago; (e) All of the above; (f) None of the above. Credit can be given for any choice, for just as it can be shown that reasonable people of good will have made a case for (a), (b), (c) and (d), it can also be argued that there are difficulties with each of these choices.

To agree that educational research began about seventy years ago is to agree with Walter Scott Monroe who wrote in 1928 that 1918 was the beginning of the modern period in educational research. All that occurred in the two or three decades before then belonged to the "pioneer period."[20] His reason for specifying 1918 as the beginning of the modern period reveals a longstanding--and probably incorrect--belief that there can be no educational research withour measurement and no measurement without standardized "objective" tests. According to Monoroe, "the facts that there were only very limited formal provisions for educational research until near the close of this period, that practically no achievement tests were available until 1915, and that group intelligence tests were not available until after 1918 probably suggest that relatively little significant research was completed before 1918."[21] For Monroe, educational research did not mature quickly. He later observed that "from the vantage point of 1945 it appears that although the development of educational measurement had passed beyond the period of infancy by 1920, it can not be described as having passed beyond the period of adolescence."[22] By 1945, it had, he claimed, "developed to perhaps the status of early adulthood."[23]

To agree that educational research began nearly a hundred years ago is to agree with Douglas E. Scates who placed more importance on the work completed in the early decades of the twenteith century than did Monroe. In a 1945 review of the progress of research in educational administration, Scates concluded that "it becomes clear that we should mislead ourselves should we entertain the notion that there was nothing of importance in educational research prior to 1920."[24] For him, the publication of Joseph Mayer Rice's "The Futility of the Spelling Grind" (1897) marks the beginning of the modern movement for the objective study of education."[25] While Rice did not have access to the subsequently developed sophisticated research techniques, he did develop methods to gather "objective" data and did consider an array of variables that have been consistently considered by educational research. As Scates pointed out, Rice

> . . . had a number of factors to dispose of before he could come to his point. Naturally the school people would argue that differences in spelling ability were the result of factors over which they had no control. Heredity? Environment? Age? As best one might without refined measures of socio-economic status, he analyzed his data with respect to these factors. . . .[26]

While Rice's tests were certainly not "model" tests, they did prove to be important. As Edward L. Thorndike pointed out in the Introduction to his text on measurement (1904) as well as in an earlier letter to Rice, there was an obvious "inequality of the units" in Rice's tests.[27] Some words were more difficult than others. That difficulty not withstanding, Thorndike's observation, as Leonard Berk has noted, made Rice's spelling test "one of

the paradigm examples of a measurement problem for the early makers of standardized tests."[28]

That the occupational-academic structure in which many of us work and in which we conduct our inquiries was being built in the 1890s is another reason to agree that educational research began about a hundred years ago. As the high school's popularity grew in the last decades of the nineteenth century, especially after 1890, so grew the interest of universities in the art and science of education. During the 1870s, several state universities began to work out certificate systems with the high schools, and by 1890, "firm well-developed systems of certification had been adopted in Michigan, Minnesota, Iowa, Wisconsin, Indiana, Illinois, Ohio, Texas, Missouri, and California." By 1900, "42 other state universities and land-grant colleges and at least 150 of the private institutions had adopted some form of certification or accrediting."[29] The concerns of universities in accrediting of high schools grew with high school school enrollments. In 1870, there were just over a thousand high schools in the United States in which nearly 72,000 students were enrolled. By 1890, the high school had become the most frequently attended type of secondary school. By the turn of the century, high school enrollment had increased to nearly 520,000. Between 1890 and 1918, new high school enrollment increased by 711 percent while the nation's population increased by only sixty-eight percent, and new high schools were being built and opened at the rate of one a day.[30]

In 1878, the University of Michigan announced that its nealy created and filled chair of "the Science and the Art of Teaching" would prepare students "for higher positions in the public school service," "promote the study of educational science," and render "a more perfect unity to

our state educational system by bringing the secondary schools into closer relations with the university."[31] From 1890 on, there was a rapid growth in university chairs of pedagogy, departments and schools of education. In 1890, professorships of education were reported in thirty-one institutions, chairs of pedagogy attached to another discipline in forty-five more, and seven universities reported lectureships in education.[32] The growth of public education not only created opportunities for careers which were earlier not available but also the need for studies so the new institutions could be managed efficiently. The needs of public schools effectively created new graduate programs, and graduate programs in education were developed almost as quickly as the enrollment in public schools increased. The University of California at Berkeley and Teachers College of Columbia University began granting the doctorate in education in 1898. The University of Chicago added the Ph.D. degree in education to its program in 1901. The University of Michigan did the same in 1902, and in 1906 the Catholic University of American began its doctoral program in education. By 1915, there were eight universities offering the Ph.D. degree in education. Between 1915 and 1919 seven more institutions began similar programs.[33]

During the period of almost instantaneous educational expansion, political science, sociology, and economics were being established as legitimate and distinct fields of scholarly inquiry. Educators were making a similar bid for their new field. They believed that "if the study of education were scholarly, and if it yeilded insights for a more rational direction of human affairs, it too could demand a place in the circle of liberal arts and sciences."[34] Whether there was or could be a science of education worthy of status as a university discipline was debated at great length by psychologists, philosophers, university presidents, and

educators.[35] Near, if not at the center of the debate about the status of education as a science was the question of how psychology related to inquiry into educational processes. William James, one of the major founders of psychology in the United States, was not so sure that psychology could provide teachers and educators all they needed and wanted. He agreed that psychology ought to help teachers, but doubted that it could provide as much guidance for pedagogical practice as teachers desired. In his Talks to Teachers, originally delivered as a series of lectures to Cambridge, Massachusetts teachers and later published in 1899, he instructed his readers:

> . . . you make a great, a very great mistake if you think that psychology, being the science of the mind's laws is something from which you can deduce definite programs and schemes and methods of instruction for immediate schoolroom use. Psychology is a science, and teaching is an art; and sciences never generate arts directly out of themselves.[36]

James' admonitions were not heeded, however. Since he offered them, both the practice of education and educational research have been closely tied to psychology and psychometrics.

While James was expressing his doubts about the utility of psychology for education, an entire generation of prospective school administrators, educational leaders, and educational leaders who were to shape our profession were preparing for their careers by studying psychology and how to apply that new science of the mind to the newly and rapidly developing field of education. There were many, but Thorndike who had

studied with James McKeen Cattell as well as with James is one of special interest and importance. After completing his work, Animal Intelligence: An Experimental Study of the Associative Processes in Animals (1898), he concluded that some of his results "possess considerable pedagogical interest."[37] Subsequently, he made a career of demonstrating how his laws of learning applied to the problems of teaching school and the preparation of texts for schools. In 1899, he joined the faculty of Teachers College, Columbia University and soon published two books which greatly influenced how educators and educational researchers approached their work: Educational Psychology (1903) and Theory of Mental and Social Measurements (1904).

For Thorndike and for many others of his generation, there was no question that the application of science in the form of psychology to the problems of public education was the way to render the means and the ends of education more efficient than they had been traditionally.[38] Inquiry into child development. learning, and ways of assessing and measuring learning and development were high on the researcher's agenda. Study of Monroe's Teaching-Learning Theory and Teacher Education, 1890 to 1950 (1952) shows not only how strongly some believed that psychology was the essential ingredient in the study of education but also how long that belief endured. Monroe effectively showed that teaching became not a problem to be studied directly but rather was viewed as something that was derived from whatever was known about learning theory. Research in teaching became little more than the attempt to derive pedagogical principles from psychology. It is not surprising that Monroe accepted the notion that education was essentially defined by learning theory and that there could be no educational research without measures of learning and measures of one's ability to learn.

Still another reason to agree that educational research began in the 1890s was offered by Charlotte M. Fleming. Writing in England just after World War II, she observed that "fifty years ago many procedures which are now familiar were quite unkown; and much current discussion would have been unintelligible to teachers skilled in the methods of the eighteen-nineties."[39] The old notion of education as "primarily the conquest of illiteracy" was replaced by a new conception whose adherents maintained that learning was "an active, complex process" and that the learner was "an active organism that developed by reacting and adjusting itself to concrete situations--perceiving, weighing alternatives, and discrimination."[40] Among those whom Fleming cited as responsible for providing "generalizations drawn from the findings of experimental study" which supported the new conception of education that attended to "the part played by pupils' physical, emotional, and social experiences" are many who properly belong to the history of psychology: James, Thorndike, McDougall, Freud, Binet, Simon, Hall, Spearman, and Wertheimer.

To agree that educational research began just over a hundred years ago is to agree that modern psychology and statistics constitute the indispensable foundations for modern educational research. Those two related areas of inquiry began to assume their present form in the 1870s. 1870 was the year that the American edition of Francis Galton's Hereditary Genius: An Inquiry into its Laws and Consequences appeared. In 1878, James opened his psychologial laboratory for demonstrations at Harvard, began work on his Principles of Psychology (eventually published in 1890), and Harvard awarded the first American Ph.D. in psychology to G. Stanely Hall. In 1879, Wilhem Wundt opened his laboratory for psychological experimentation, and soon thereafter, according to Robert M. W. Travers, "everyone,

across the world, who had aspirations of becoming a psychologist and the money to spend a year in Europe, came to work with Wundt."[41] Even if Travers' estimate of Wundt's popularity is overstated, there is no denying Wundt's early importance. Among those who studied at his laboratory are G. Stanley Hall who was an important contributor and popularizer, if not the founder, of the child study movement; Charles H. Judd who was responsible for a series of important research studies at the University of Chicago; James McKeen Cattell who influenced many American psychologists, including Thorndike; and Edward Bradford Titchener who, though a native of England, devoted his career to the psychological laboratory at Cornell University where he taught several who contributed greatly to American psychology and/or education, including William Chandler Bagley and Guy Montrose Whipple.

To agree that educational research began about one hundred and forty years ago is to agree with Travers who locates its origins outside the confines of testing, measurement, statistics, and even modern psychology. For him, it begins several decades before serious attempts were made to free psychology from philosophy, so it could become "scientific," several decades before measurement and statistics became part of the educator's repertoire, and even before the growth in the popularity of the high school. Twentieth century education and twentieth century educational research, he maintains, are built on the foundations set down by Henry Barnard, Horace Mann, and William Torrey Harris. "Both Barnard and Mann," he writes, "must be credited with the social invention of using empirical data for the management and development of the schools."[42] Harris built on what Barnard and Mann developed and "was attempting to bring together the scientist and educator a full decade before Thorndike began to bring his new experi-

mental psychology to bear on the problems of education and two decades before Judd began to develop a psychology of school subjects."[43] In a Report of the Committee on Educational Research of the National Academy of Education, Barnard is given credit for beginning modern educational research. There it is suggested that the beginning of his American Journal of Education (1855) marks the beginning of the "prescientific" period of educational research--a period of research based on "the German ideal of Wissenschaft or systematized assembly of knowledge." The "pre-scientific" stage, according to this view, gave way to the beginning of the scientific stage about forty years later when James' Principles of Psychology appeared, when John Dewey established his laboratory school at the University of Chicago, and when Rice and Thorndike began to make their contributions to what is described as "a period of vigorous empiricism, with emphasis on the quantitative measurement of educational effectiveness."[44]

While each approach emphasizes important developments and traditions, each also excludes some. Each has advantages as well as disadvantages. By placing the beginning of educational research in an era prior to the beginning of modern psychology, Travers suggests that we can fashion a history of educational research that may be something other than a history of educational psychology or a history of some applications and mis-applications of psychology to education. It is also a suggestion that a history of educational research need not be bogged down in the is-education-a-science question and the is-education-one-or-several-disciplines question.[45] It also allows us to entertain seriously the possibility that the origins of the educational researcher's problems, the manner and the site where conclusions must be verified may all be different from those in the soical and the behavioral sciences. To the extent that Travers' claim that modern

educational research began before the development of modern psychology and modern measurement techniques is true, we are obliged in our efforts to understand the origin, nature, and logic of our educational beliefs and practices to look beyound the subsequent "scientific" justifications we have attached to them. By locating the origins of educational research in the development of the modern public school system, he makes it difficult for us to divorce considerations of the social, economic, and political purposes of public eduation form the purposes of educational research.

However, if Travers is used as a guide for assembling a history of educational research, it is possible that insufficient attention would be paid to what others deem very important. While Monroe and Scates emphasized "objective measurement" as essential in educational research, Travers insists that "measurement and statistics cannot form the core of a vigorous educational research enterprise any more than a course on the design of meters could constitute the core of engineering."[46] Educational research that has "involved massive testing programs," he claim, "seems to have been the least productive, and also the most expensive."[47] Whether one believes that testing and measurement constitute the most reliable technology available to educational researchers or whether one believes that the widespread use of testing has served great injustices to many innocent children, there is no denying its importance. The use of testing has escaped the attention of neither the historian nor the psychologist.[48] The school survey which frequently involved mass testing programs has also received some attention from the historian of education.[49] Recent work indicates that the school survey may have been not only the mechansim whereby new developments were introduced into the schools but also afforded eduational researchers the opportunity to gather data and to assess the

the extent to which new developments were being successfully introduced into the schools.[50]

While Travers' claim that educational research began with the founding of the public schools has great merit and utility, we should look beyond what school leaders commissioned to determine what constitutes educational research, past or present. Yet, it can not be overlooked that the requirements of public school leaders, those whom David Tyack calls "administrative progressives" who were building what he calls the "one best system,"[51] did greatly influence what researchers did. In fact, Tyack and Hansot have concluded that "although there was some basic research in education in the years from 1890 to 1930--the investigations of John Dewey, Edward L. Thorndike, and Lewis Terman, for example--the great bulk of investigation was applied, especially in the field of administration."[52] The researcher's agenda was, in many instances, set by the public school administrators who were either assembling or reforming their school systems. Even Monroe noted that

> Many educators, including most superintendents and principals appear to think of educational research as consisting of the activities of collecting, organizing, and disseminating information about schools. According to this point of view, the research worker is primarily a combination of a high-grade accountant and publicity agent.[53]

Use of Monroe as a guide for the history of educational research would allow us to overlook neither tests and measurements nor the many "decision-oriented" inquiries in our history. Tyack and Hansot have observed that

Monroe's Ten Years of Educational Research which they describe as "an extraordinarily complete bibliography" shows that for the period covered, 1918-27, "the great mass of research studies in education were addressed to practical administrative and pedagogical concerns, frequently employing quantitative techniques."[54] While the requirements of educational leaders did undoubtedly shape much educational research, we know from Fleming and Travers that not all of what might be called educational research was originated within the confines of either public schools or departments and/ schools of education. The educational leaders also selected work--work that was frequently not specifically designed to solve specific school problems--simply because they shared in the widely held belief that the application of science to human affiars would make matters better. Travers points out that Harris "was attempting to bring together the scientist and the educator" at least a full decade before the techniques of experimental psychology were applied to educational problems. Fleming pointed out that the differences between school practices of the 1890s and the 1940s was the result of a new conception of the learner which was provided by researchers whose attention was not restricted to learning and development in schools. Moreover, not all who contributed to the new coneption of education used quantitative techniques in their investigations. There are, as we know, no significant correlations in either Dewey's or Freud's works.

Researchers may have responded to school leaders, but school leaders also responded to researchers. Some movements were compatible and concurrent but not necessarily related. The case of child study is a good and relevant example. Some participants in the child study movement--a movement which began in the 1880s and was very popular by the mid 1890s--were quite interested in improving the lot of children in schools. However,

not all workers in the field focused their attention solely on children in school. Some were advocates of children's welfare and were arguing that children were either so important or so valuable that that society needed to know more about them. For others, however, developments in nineteenth century science, especially Darwin's work and the attempts to apply Darwinian or Darwin-like principles to the study of hmankind, made possible new conceptions of children, and those new conceptions made the study of children a subject worthy of investigation apart from any desire to improve schooling. As George H. Daniels has observed,

> The biological concepts of continuity and inheritance had made the child distinctive--worth studying for his own sake--in marked contrast to the older associationist psychology, which held that the child was merely an adult in minature. The child was thought to be closer to the origins of the human mind, for the mind of the adult is too much overlaid by experiences to reflect the basic forces of biological inheritance. It was primarily this belief that the child was more attuned to the primeval mind, rather than a concern for improvements in education, that provided the critical push toward the systematic study of children that was developing concurrently with Dewey's New Pedagogy.[55]

The attempts to develop a new pedagogy and to improve the efficacy of schooling certainly benefited from the systematic study of children, but the study and the reform movements were not necessarily logically related.

If one agrees that the child study movement and the attempts to reform schooling intersected, that educators (administrators and researchers)

used the findings of the child study movement to realize their own purposes, and that some child study activitists urged reforms and programs for schools based on their findings--G. Stanley Hall is an obvious example,[56] then a complete history of educational research would have to attend to the child study literature. It is a body of literature which can be said to begin in 1882 when William Preyer published The Mind of the Child and ended in 1914 when William Stern reviewed nearly all the significant studies in childhood in his Psychology of Early Childhood.[57] Stern's work can be viewed as the final major statement of a movement which had then lost its identity as a distinct movement. However, by then the concerns of the child study movement had been taken over by educational psychology. A few decades later, educational psychologists even saw the child study movement as the beginning of educational psychology.[58]

While the claim that educational research began before the development of modern psychology can be sustained, it would be a mistake not to examine how the development of psychology, especially experimental psychology, contributed to what was once called experimental pedagogy, or experimental education. By the time the Cyclopedia of Education went to press, there was an identifiable effort to distinguish between the old and the new experimental pedagogy. Practices based on the Herbartians' methods of observing classroom events were viewed as the old, or not truly experimental pedagogy, for they entailed only observation.[59] Certainly, Dewey's laboratory school at the University of Chicago belongs under this heading, but there is more. Perhaps the best starting point for consideration of experimental pedagogy is the work of one of Wundt's outstanding students, Ernst Meumann. Meumann began to outline a plan for experimental pedagogy in 1901 and by 1907-08 he had produced a three-volume work on the psychological foundations

of experimental pedagogy. Experimental pedagogy, he maintained, was built on the foundations provided by researchers and teachers who worked in classrooms as well as by those who worked in traditional academic psychological laboratories.[60] Meumann's view was not universally shared, however. Wilhelm Lay who jointly founded the journal Die Experimentelle Pädagogik with Meumann insisted that experimental pedagogy be founded exclusively on the basis of classroom experiments.[61]

There is reason to accept the claim that there is merit and utility in each of the possible answers to the question, "When did modern educational research begin?" Such acceptance diminishes the possiblity of neglecting important developments and contributions. The weaving together of all possible beginnings offers the possibility of a rich, if complicated, history. If such an approach were taken, only three more issues would need to be addressed to insure not only a complete history but also a suitable context for that history. First, it is necessary not to neglect the contributions of researchers associated with disciplines and methods other than those directly related to psychology, statistics, and measurement. The kinds of inquiries undertaken by Willard Waller, John Dewey, Ellwood P. Cubberley, Merle E. Curti, and others have given us conceptions with which we interpret and organize our inquries. However, inclusion of such contributions should not lead us to accept the ordinary distinction between "quantitative" and "qualitative" methods and studies as an organizing principle for our history. We should avoid claims that one is as good, worse, or better than the other. To engage in such claims is to accept an oversimplification and to accept and unwarranted confusion about the meaning of "subjective" and "objective."

We must also explore the climate of opinion which has for so long sustained the belief that educational research rooted in the principles of science will somehow eventually provide useful, efficient, and just direction for our educational undertakings. We know that since the end of the nineteenth century, our faith in science has grown. Since then, we have used it where we once would have employed tradition or religion as a guide. By the end of the nineteenth century, as Daniels has recorded,

> Science was coming more and more to supply American social thought with its vocabulary and its supply of images. It served as a major source of metaphor and, like figures borrowed from any area, the analogies drawn from science variously suggested, explained, and justfied social categories and values. This reflects the changing position of science in the hierarchy of American values; for since that time it has had a growing role as an absolute, able to justify and expected to motivate individual behavior.[62]

The lesson the early twentieth century progressives learned from the nineteenth century was that science was "the mainspring of inevitable progress."[63] From Karl Pearson's widely read The Grammar of Science (1892), American progressives dervied the notion that "the sucesses of science were based upon a known technique termed 'the scientific method,' and that this method could be applied to all human problems."[64] During the progressive era, it was believed that "research," "another magic word of the period, would allow the expert to solve problems--in government, in industry, in social enterprises of every sort."[65]

Finally, we must ask about the origins of our modern frame of mind, about the origins of science, and our notions about the applicability of science to human affairs. The answer to that question can, as Hamilton has shown can be pushed back to the scientific revolution of the sixteenth and seventeenth centuries--to the time when Bacon, Descartes, and Newton were effectively disassembling the orderly medieval natural order. While Descartes refined the notion of method by showing how complex phenomena could be reduced to simple parts, Bacon explained that science was important because it would allow for public control and profit from nature. Newton further demonstrated how powerful science was by showing that it would allow us to predict events. According to Hamilton,

> The excitement generated by these ideas, and the analogic thinking that they prompted, ran rapidly through the whole realm of natural philosophy. Could Newtonian notions account for the behaviour of living as well as inanimate bodies? Was there a moral force, akin to gravity, that held together the disparate parts of civil society? Could complex social phenomena be reduced to a small number of basic human faculties? And did the motive forces furnished by such dispositions interact together in comparable causal patterns? [66]

If we wish not to be pushed back to the sixteenth and seventeenth ceunturies, we may be able to stop at Darwin who "presented to the world one of the first examples of the long, tightly reasoned hypothetical method that has come to be characteristic of modern science." [67] Darwin demonstrated that "theory" did not just flow from the facts. There is

little doubt that our enterprise and the assumptions on which it is built have been influenced by Darwin. That Dewey[68] and Thorndike[69] each found it appropriate, if not necessary, to address the issue of Darwin's influence shows that Darwin's influence is real and probably complex.

Notes

1. For an interesting and unusually optimistic series of statements about possible directions for educational research in the 1980s see Frank H. Farley's "The Future of Educational Research," Educational Researcher, Vol. 11, No. 8 (October 1982), pp. 11-19 for part 1 and Vol. 11, No. 9 (November 1982), pp. 12-18 for part 2. It is an edited version of a panel earlier organized for an AERA meeting and includes statements from N. L. Gage, Benjamin S. Bloom, David R. Kratwohl, Robert M. Gagne, Robert Glaser, Robert Ebel, Robert L. Thorndike, Fred M, Kerlinger, W. James Popham and Maxine Greene.

2. See, for example, Ernest R. House, "Three Perspectives on Innovation" in Rolf Lehming and Michael Kane (eds.). Improving Schools: Using What We Know (Beverly Hills, California: Sage Publications, 1981).

3. See: Lehming and Kane. Improving Schools.

4. See: Thomas S. Popkewitz. Paradigm and Ideology in Educational Research: The Social Function of the Intellectual (London: The Falmer Press, 1984).

5. Ibid., p. 88.

6. D. C. Phillips, "Post-Kuhnian Reflections of Educational Research" in Jonas F. Soltis (ed.). Philosophy and Education: Eightieth Yearbook of the National Society for the Study of Education, Part I (Chicago: The University of Chicago Press, 1918), p. 257.

7. The United States is not, of course, the only place where educational researchers tended to ignore teachers and teaching. In a discussion of the development of education research in Great Britain, David Hamilton ("Bread and Circuses: Some Challenges to Educational Research in the 1980s," Presidential address delivered at the Conference of the British Educational Research Association, Cancaster, 30th August-2nd September, 1984 (Forthcoming in the British Educational Research Journal)) observes that there "the Academy selectively nurtured the social sciences in the interests of what have been called the regulative functions of the state" (p. 10). He further points out that in a review of F. W. Taylor's Principles of Scientific Management, "John Adams (Professor of Education at the University of London)

pinpointed the issue at statke: 'Perhaps the most important problem in the educational theory of the future,' he wrote, 'is the place the teacher is to occupy'"(pp. 9-10). William Boyd and Godfrey Thompson were, Hamilton claims, the exeptions which proved the rule.

8. How to define educational research has been a longstanding problem. For an early discussion of the issue see: Walter Scott Monroe, "Ten Years of Educational Research, 1919-1927," University of Illionis Bureau of Educational Research Bulletin No. 42, University of Illinois Bulletin, Vol. 25, No. 51. 1928, pp. 15-29.

9. For a bibliography of the literature on these questions see: Bird T. Baldwin, "Principles of Education," The Present Status of Education as a Science, Papers presented for discussion at the meeting of the National Society of College Teachers of Education in St. Louis, Missouri, Feburary 27-29, 1912. School Review Monographs Number II (Chicago: University of Chicago Press, 1912), pp. 129-134. Baldwin's bibliography containes over one hundred entries and includes works from Europe as well as the United States. Also see: Walter S. Monroe and Max D. Englehart. The Scientific Study of Educational Problems (New York: The Macmillan Co., 1936), p. 452.

10. Robert M. Ebel in Farley, "The Future of Educational Research," p. 18.

11. John Dewey. The Sources of a Science of Education (New York: Horace Liveright, 1929), p. 13.

12. Fred M. Kerlinger, "Research in Education" in Robert L. Ebel (ed.). Encyclopedia of Educational Research, 4th ed. (Toronto: Collier-Macmillan, 1960), p. 1127.

13. Ibid.

14. Lee J. Cronbach, "Beyond the Two Disciplines of Scientific Psychology," American Psychologist, Vol. 30, No. 2 (February 1975).

15. Lee J. Cronbach, Patrick Suppes, et. al. (eds.). Research for Tomorrow's Schools (New York: The Macmillan Co., 1969).

16. David Tyack and Elisabeth Hansot. Managers of Virtue: Public School Leadership in America, 1820-1980 (New York: Basic Books, Inc., 1982), p. 153.

17. Robert M. W. Travers. How Research Has Changed American Schools: A History from 1840 to the Present (Kalamazoo, Michigan: Mythos Press, 1983), p. 125.

18. A noteworthy attempt to assess the influence of research on teaching is Geraldine Joncich Clifford, "A History of the Impact of Research on Teaching" in Robert M. W. Travers (ed.). Second Handbook of Research on Teaching (Chicago: Rand McNally, 1973). Also see Patrick Suppes (ed.). Impact of Research on Education: Some Case Studies (Washington, D. C.: National Academy of Education, 1973).

19. C. Winfield Scott, Clyde M. Hill and Hobert W. Burns (eds.). The Great Debate: Our Schools in Crisis (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1959).

20. Monroe, "Ten Years of Educational Research," p. 44.

21. Ibid., p. 41.

22. Walter Scott Monroe, "Educational Measurement in 1920 and 1945," Journal of Educational Research, Vol. 38, No. 5 (January 1945), p. 334.

23. Ibid., p. 340.

24. Douglas E. Scates, "Research and Progress in Educational Administration," Journal of Educational Research, Vol. 38, No. 5 (January 1945), p. 351.

25. Douglas E. Scates, "Fifty Years of Objective Measurement and Research in Education," Journal of Educational Research, Vol. 41, No. 4 (December 1947), p. 241.

26. Ibid., p. 244.

27. Edward L. Thorndike. An Introduction to the Theory of Mental and Social Measurements (New York: Science Press, 1904), p. 8.

28. Leonard Berk, "Educational Science and Popular Journalism: The Case of Joseph Mayer Rice," Paper resented at AERA, Montreal, March 1983, p. 5.

29. Frederick Rudolph. The American College and University (New York: Alfred A. Knopf, 1962), p. 284.

30. David B. Tyack. The One Best System: A History of American Urban Education (Cambridge, Massachusetts: Harvard University Press, 1974), p. 183.

31. B. A. Hinsdale. History of the University of Michigan (Ann Arbor, Michigan: University of Michigan, 1906) in Edgar W. Knight and Clifton L. Hall (eds.). Readings in American Educational History (New York: Appleton-Century-Crofts, Inc., 1951), p. 423.

32. Newton Edwards and Herman G. Richey. The School in the American Social Order. 2nd. ed. (Boston: Houghton Mifflin Co., 1963), p. 605.

33. Harold E. Moore, John H. Russel, and Donald G. Ferguson. The Doctorate in Education: Volume II--The Institutions (Washington, D. C.: The American Association of Colleges for Teacher Education, 1969), p. 5.

34. Merle L. Borrowman, "Liberal Education and the Professional Preparation of Teachers," in Borrowman (ed.). Teacher Education in America: A Documentary History (New York: Teachers College Press, 1965), p. 12.

35. Borrowman, "Liberal Education and the Professional Preparation of Teachers," pp. 11-14; and Arthur G. Powell. The Uncertain Profession: Harvard and the Search for Educational Authority (Cambridge: Massachusetts: Harvard University Press, 1980), pp. 41-47.

36. William James. Talks to Teachers on Psychology (New York: Dover Publications, Inc., 1962), p. 3.

37. Edward L. Thorndike. Animal Intelligence:. Experimental Studies (Darien Connecticut: Hafner Publishing Co., 1970), p. 149.

38. For an account of one, William C. Bagley, who began his career with the belief that a science of education could be built on psychology but later came to a different conclusion see: Erwin V. Johanningmeier, "William Chandler Bagley's Changing Views on the Relationship Between Psychology and Education," History of Education Quarterly, Vol. 9, No. 1 (Spring 1969). While Bagley did surrender the notion that psychology could provide the foundation for a science of education, others held to that belief. There is some reason to believe that the promise embedded in that belief has not yet been realized. As two prominent educational psychologists have observed, at the turn of the century "empirical research, primarily psychological, seemed to be only a few short years from solving the problems of education by providing the scientific underpinning for instructional practice." However, the marriage of education and psychology turned out to be a "dissapointing marriage." See: David C. Berliner and N. L. Gage, "The Psychology of Teaching Methods" in N. L. Gage (ed.). The Psychology of Teaching Methods: The Seventy-fifth Yearbook of the National Society for the Study of Education, Part I (Chicago: University of Chicago Press, 1976), p. 1.

39. Charlotte M. Fleming. Research and the Basic Curriculum (London: University of London Press, Ltd., 1946), p. 1.

40. Ibid., p. 2.

41. Travers. How Research Has Changed American Schools, pp. 64-65.

42. Ibid., p. 47.

43. Ibid., p. 46.

44. Cronbach and Suppes. Research for Tomorrow's Schools, pp. 33-34.

45. Charles J. Brauner. American Educational Theory (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1964).

46. Travers. How Research Has Changed American Schools, p. 157.

47. Ibid., p. 154.

48. See, for example: Ned Block and Gerald Dworkin (eds.). The IQ Controversy (London: Quartet Books, 1977); Lee J. Cronbach, "Five Decades

of Public Controversy Over Mental Testing," American Psychologist, Vol. 30, No. 1 (January 1975); Clarence J. Karier (ed.). Shaping the American Educational State (New York: The Free Press, 1975); Brian Simon. Intelligence, Psychology and Education (London: Lawrence and Wishart, 1971); and James V. Smith and David Hamilton (eds.). The Meritocratic Intellect: Studies in the History of Educational Research (Aberdeen: Aberdeen University Press, 1980).

49. The work which brought the survey to the attention of educational historians is Raymond E. Callahan. Education and the Cult of Efficiency (Chicago: The University of Chicago Press, 1962).

50. Nancy E. Adelman, "Sphere of Influence: Factors in the Educational Development of Three New Jersey Communities in the Progressive Era" in Ronald K. Goodenow and Diane Ravitch (eds.). Schools in Cities (New York: Holmes and Meier, 1983).

51. Tyack. The One Best System.

52. Tyack and Hansot. Managers of Virtue, p. 154.

53. Monroe, "Ten Years of Educational Research," p. 21.

54. Tyack and Hansot. Managers of Virtue, p. 154.

55. George H. Daniels. Science in American Society: A Social History (New York: Alfred A. Knopf, 1971), p. 250.

56. See: G. Stanley Hall, "The Ideal School as Based on Child Study" in Charles E. Strickland and Charles Burgess (eds.). Health, Growth, and Heredity: G. Stanley Hall on Natural Education (New York: Teachers College Press, 1965).

57. Significant works between those of Preyer and Stern are: James Sully. Studies in Childhood (London: Longmans Green, 1895); Karl Groos. Die Spiele der Tiere (Jena: Fischer, 1896) and Die Spiele des Menschen (Jena: Fischer, 1899); Ellen K. S. Key. Barnets Arhundrade, (Stolkholm: A. Bonnier, 1900); Alred Binet. La Suggestibilite (Paris: Schleicher Freres, 1900) and Les Idees Modernes sur l'Enfants (Paris: Flammarion, 1909); Antonia Marro. La Puberta (Torino: Bocca, 1897); and G. Stanley Hall. Adolescence (New York: Appleton, 1904).

58. Gordon Hendrickson, "Educational Psychology" in Walter S. Monroe (ed.). Encyclopedia of Educational Research (New York: Macmillan, 1941), p. 417.

59. Edward H. Cameron, "Experimental Pedagogy" in Paul Monore (ed.). A Cyclopedia of Educational Research, Vol. II (New York: The Macmillan Co., 1911), pp. 551-552.

60. Ernst Meumann. Vorlesungen zur Einfürung in die experimentelle Pädagogie (Leipzig: Engleman, 1907-08). Meumann's Oekonomie und Technik des Gedachtnisses (1908) was translated by J. W. Baird as The Psychology of Learning (New York: Appleton, 1913).

61. Lay's major works include: Experimentelle Didaktik (Wiesbaden, 1903); Experimentelle Padagogik (Leipzig: Teubner, 1908) which was translated by A. Weil and E. K. Schwartz and appeared as Experimental Pedagogy (New York: Prentice-Hall, 1936); and Die Tatschule (Leipzig: Zickfeldt, 1911).

62. Daniels. Science in American Society, p. 264.

63. Ibid., p. 290.

64. Ibid., p. 296.

65. Ibid., p. 303.

66. Hamilton, "Bread and Circuses," p. 4.

67. Daniels. Science in American Society, pp. 240-241.

68. See John Dewey, "The Influence of Darwinism on Philosophy," Popular Science Monthly (July 1909) in John Dewey. The Influence of Darwinism on Philosophy and Other Essays in Contemporary Thought (New York: Peter Smith, 1951). According to Dewey, "the 'Origin of Species' introduced a mode of thinking that in the end was bound to transfrom the logic of knowledge, and hence the treatment of morals, politics, and religion" (p. 2).

69. Edward L. Thorndike, "Darwin's Contribution to Psychology," University of California Chroncile, Vol. 12 (1909). Edited version in Geraldine M. Joncich. Psychology and the Science of Education: Selected Writings of Edward L. Thorndike (New York: Teachers College Press, 1962).